2.0 SETTING: NATURAL AND BUILT LANDSCAPE

2.1 Location

Figure 2.1-1 depicts the 15 municipalities that lie entirely or partially within the Wallkill, Pochuck & Papakating Watershed Management Area (WMA 02) boundary. Sussex County overlies almost the entire Management Area with the exception of a small portion of the eastward wing which extends into Passaic County (and West Milford Township). The area and population density for each municipality is provided in Table 2.1-1 in Appendix 1. WMA 02 includes parts of five watersheds (Figure 2.1-2) that drain portions of northwestern New Jersey. WMA 02 encompasses 208 square miles and at the widest points is approximately 23 miles long and 20 miles wide. WMA 02 straddles the boundary between the Valley and Ridge Physiographic Province (western portion of the WMA) and the Highlands (eastern portion). Land elevations (Figure 2.1-3) begin at slightly over 400 feet above sea level within the Pochuck river valley and extend beyond 1600 feet along the upper north west edge of the WMA. The overall topography consists of a network of broad river valleys spread out amongst rolling hills. Dramatic increases in relief are restricted to relatively narrow bands forming the northwest rim and along portions the eastern border of the WMA. The Wallkill flows north into New York, eventually passing New Paltz in Ulster County and converging with the Hudson River approximately 15 miles north of New Paltz.

There are over 80 dams and impoundments on the rivers and streams in WMA 02 (Figure 2.1-4) creating localized lake-like conditions, which can affect flow, water quality and sedimentation. Dam is defined as "any artificial dike, levee or other barrier, together with appurtenant works, which is constructed for the purpose of impounding water on a permanent or temporary basis, that raises the water level five feet or more above the usual, mean, low water height when measured from the downstream toe-of-dam to the emergency spillway crest or, in the absence of an emergency spillway, the top-of dam" (N.J.A.C. 7:20-1.8). These dams are classified based on safety considerations (i.e., potential failure impacts on people, property or the impoundment's integrity itself).

Class I - High Hazard Potential: probable loss of life/extensive property damage.
Class II - Significant Hazard Potential: significant damage to property
Class III - Low Hazard Potential: loss of the dam itself
Class IV - Small Dams: impounds less than 15 acre-feet of water to top of dam.

2.2 Surface Water Hydrology

The New Jersey portion of WMA 02 includes the following watersheds:

Watershed	Drainage (sq. mi.)	Watershed	Drainage (sq. mi.)
Wallkill River (Upper and Lower)	90.2	Papakating Creek	60.6
Pochuck Creek	54.3	Rutgers Creek Tributaries	3.2

These New Jersey drainages consist of headwaters which then flow into lower New York State to then drain into the Hudson River Watershed (Figure 2.2-1). The complete watersheds are therefore are co-managed by both NJDEP, the New York Department of Environmental Conservation (NYDEC) and the Interstate Sanitation Commission (ISC) a bi-state autonomous agency which encompasses regional waterway planning, monitoring, environmental management activities as well as federal reporting requirements under Section 305 (b) of the Clean Water Act. More detailed information on these watersheds is supplied below.

2.2.1 Wallkill River

The Wallkill River is divided into both upper (61 square miles) and lower (30 square miles) sub-watersheds, divided just south of the confluence with the Papakating Creek or just east of Sussex Borough. The Wallkill River in New Jersey is 27 miles long. The river's headwater begins as the outflow of Lake Mohawk in Sparta Township in the southern-most portion of the WMA and then runs north by north east, flowing through Ogdensburg, Franklin and Hamburg Boroughs, eventually forming the border between Wantage and Vernon Townships. The river runs the length of the WMA roughly bisecting it into east and west halves before exiting into New York. There are numerous lakes and ponds in the watershed including Lake Mohawk, Newton Reservoir, Beaver Lake, Lake Grinnell and Walkill Lake. There are 10 permitted discharges to surface water in the watershed. These discharges will be discussed in more detail in Section 4: Contributing Factors.

2.2.2 Papakating Creek

Papakating Creek drains an area of 61 square miles which represents much of WMA 02. This 15 mile long creek runs **t**hrough north-central Sussex County to join the Wallkill River just east of Sussex Borough. Major tributaries to the Papakating include the West Branch Papakating Creek and Clove River. The watershed contains two permitted discharges to surface water.

2.2.3 Pochuck Creek

The Pochuck Creek drainage basin is 49 square miles. The New Jersey portion of the River is 8 miles long and flows northward into New York State eventually joining the Wallkill River above Eden, New York in Orange County. The major tributaries to the Pochuck include Black Creek, Wawayanda Brook and Lake Lookout Brook. Significant Lakes in the region include Upper Greenwood Lake, Lake Wawayanda and Highland Lake. There are 4 permitted discharges to surface water in the watershed.

2.2.4 Rutgers Creek Tributaries

Only about 7.5 miles of stream comprise the New Jersey portion of this largely New York based watershed which extends into New Jersey at the northwestern corner of WMA 02. Streams in this sub-watershed either begin in New Jersey or have their origins

in New York just above the border and then flow into New Jersey before returning back into New York. These tributaries are part of a larger system which drains portions of the western Wallkill River watershed in New York State and join the mainstem Wallkill River north of Eden in Orange County.

2.3 Land Use

Level I land use and land coverages (LU/LC) for WMA 02 are shown on Figure 2.3-1. Level I depictions are provided in the Figure since they allow the best level of resolution across relatively large areas. Level II LU/LC can be selected and analyzed in each major classification area as described below which will be utilized in a subsequent more detailed assessment of WMA 02 probably on a watershed basis. These digital land use data were generated from 1986 aerial photogrammetry. NJDEP is updating this land use/land cover data statewide using 1995/97 overflights. While this work is expected to be completed in 2000, new urban lands developed between 1987 and 1995 are currently available and are depicted in Figure 2.3-2. Addition land use characterizations for WMA 02 will be updated as these new data becomes available.

The primary land use classifications in WMA 02 (as represented in Figure 2.3-1 for 1986) include: 13 % urban or built land, 57 % forested, 21 % agricultural, 5 % wetlands, 1 % barren lands and 3 % water. Figure 2.3-2 shows an increase of 4.3 square miles of urban lands occurring between 1987 and 1995, principally converted from forested and agricultural land. Agricultural lands appear to concentrate in the lower central and western third of WMA 02 with an additional cluster along the Pochuck. Agricultural lands appear least in the eastern uplands. Although forested lands are located throughout the WMA, contiguous forests are most abundant in the central and eastern portions of the WMA. Built lands appear widely scattered with clusters tightly surrounding Lake Mohawk, as well as Highland, Barry and Lower Greenwood Lakes. In addition, many built areas are closely nested adjacent to streams. The overall result of this pattern of clustering around waterways is to increase the potential for direct and significant nonpoint source impacts to the adjacent lakes and streams within WMA 2.

2.3.1 Urban or Built (up) Lands

The Level I Urban or Built-up Land category is characterized by intensive land use where the landscape has been altered by human activities. Although structures are usually present, this category is not restricted to traditional urban areas. Urban or Built-up Land Level II categories include Residential; Commercial and Service; Industrial; Transportation, Communication and Utilities; Industrial and Commercial Complexes; Mixed Urban or Built-up; Other Urban or Build-up and Recreational. Included with each of the above land uses are associated lands, buildings, parking lots, access roads, and other appurtenances, unless these are specifically excluded.

2.3.2 Forest

This Level I category contains any lands covered by woody vegetation other than wetlands. These areas are capable of producing timber and other wood products, and of

supporting many kinds of outdoor recreation. Forestland is an important category environmentally, because it affects air quality, water quality, wildlife habitat, climate, and many other aspects of the ecology of an area. The Level II categories under Forestland are Deciduous; Coniferous; Mixed Deciduous-Coniferous; and Brushland.

2.3.3 Agricultural

This Level I category includes all lands used primarily for the production of food and fiber and some of the structures associated with this production. These areas are easily distinguished from the other categories and represent a significant land use in New Jersey. The Level II categories of Agricultural Land are; Cropland and Pastureland; Orchards; Vineyards; Nurseries/Horticultural Areas; and Confined Feeding Operations. Agricultural facilities can be of environmental concern because of the potential for non-point source pollution associated with fertilizer and pesticide applications as well as livestock management activities.

2.3.4 Wetlands

The wetlands are those areas that are inundated or saturated by surface or ground waters at a frequency and duration sufficient to support vegetation adapted for life in saturated soil conditions. Included in this category are naturally vegetated swamps, marshes, bogs and savannas which are normally associated with topographically low elevations but may be located at any elevation where water perches over an impervious subsurface layer (e.g., clay lens). Wetlands that have been modified for recreation, agriculture, or industry are not included but described under that specific use category. The wetlands of New Jersey are located around the numerous interior stream systems, and along our coastal rivers and bays. New Jersey, by its numerous different physiographic regions, supports various wetland habitats dependent upon physiographic and geological variables. The Level II classification separates wetlands into a variety of categories based on vegetation type (e.g., grassy, shrub, forested) and flow conditions (e.g., tidal vs. non-tidal). Wetlands appear to be widely scattered throughout the WMA, however, notable concentrations are observed adjacent to the central Wallkill River channel and the channels of the Pochuck and Black Creeks.

2.3.5 Barren Lands

Barren lands are characterized by thin soil, sand or rocks and a lack of vegetative cover in a non-urban setting. Vegetation, if present, is widely spaced. Barren land such as beaches and rock faces are found in nature but also result from man's activities. Extraction mining operations, landfills and other disposal sites compose the majority of man-altered barren lands. Of concern under this land use category are mines or quarries which often require NJPDES permits for pump out activities. Upon abandonment some of them may also become landfills which in turn can become nonpoint pollution sources. A review of locations delineated as "extraction mining" show numerous sites in the central portion of the Wallkill watershed especially in the vicinity of Hardyston Township, Hamburg Borough and Ogdensburg Borough. Many large sites appear to be

directly adjacent to the Wallkill. In addition, what appears to be a large site lies close to the Black Creek in the center of Vernon Township.

2.3.6 Water

All areas within the landmass of New Jersey, periodically covered by water, are included in this category. All waterbodies are delineated as they existed at the time of data acquisition, except areas in an obvious state of flood. Level I includes four (4) Level II categories; Streams and Canals; Natural Lakes; Artificial Lakes; and Bays and Estuaries. Not included in this category are water treatment and sewage treatment facilities. Stream or flowing waters in WMA 02 represent portions of the headwaters of a very large watershed which lies predominantly in New York State. Lakes within this WMA are most likely a mixture of natural (largely formed via glaciating processes), artificial (manmade impounded streams) and augmented natural lakes (natural lakes which are enhanced is size through the addition of an impoundment). A review of dams associated with lakes in WMA 02 (Figure 2.1-4) indicate that most lakes over five acres in size appear to be associated with one or more dams.

2.4 Population

Population density is usually a good indicator of potential human stress on the lands and waters of an environment. Municipal total population and population density (census) data in WMA 02, as of 1990, are provided in Table 2.1-1. Population densities for 1990 are illustrated in Figure 2.4-1. Historical population change for municipalities (1930 - 1990) is illustrated in Figure 2.4-2 and presented on Table 2.4-2a. Population change expressed as percentages from 1970 to 1980 and from 1980 to 1990 are presented on Table 2.4-2b. Population projections to the year 2020 are illustrated in Figure 2.4-3 and provided on Table 2.4-3 (along with percent change 1990 to 2020). Municipality population change (1930 - 1990) combined with projections to the year 2020 are graphically represented in Figure 2.4-4 (1960 - 1990) and contained in Table 2.4-4.

Populations in WMA 02 are clustered around Lake Mohawk in Sparta Township, and around Highland and Upper Greenwood Lakes in West Milford and Vernon Townships respectively. Other clusters are in and just west of Sussex Borough, and in the Boroughs of Ogdensburg, Franklin and Hamburg. Of concern for water quality is that these population clusters closely adjoin many of the major lakes and rivers of the WMA. Water quality may be impacted by these population clusters closely adjoining many of the major lakes and rivers due to the associated non-point sources of pollution (i.e., impervious surfaces storm water runoff, septic individual wastewater system failures, lawn care products, etc.)

The population of WMA 02 has shown substantial growth within the past twenty years. Based upon census data between 1970 and 1990, Wantage, Vernon and Frankford Townships, for example, have shown robust growth at 119%, 250%, 84%, respectively. Some municipalities, in contrast have shown limited growth such as Franklin Borough at 17% and Sussex Borough at 8%. Although West Milford, Byram and Montague townships have shown growth (47%, 75% and 150% growth, respectively), most of their impacts are most likely felt in the neighboring WMAs.